
***SMARTEYE* Sender/Receiver Reader**

User Manual

Revision 5



related documents:

SMARTEYE Electronics Assembly User Manual

SMARTEYE S-net with DeviceNet User Manual

SMARTEYE Twin User Manual

SMARTEYE Single-P User Manual

SMARTEYE Single-S User Manual

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1.0 Introduction

The Smarteye Sender/Receiver Reader senses an identification number coded into a Smarteye Label. When a label moves past a reader, signals are sent from the reader, enabling the control unit (SEA-8, Twin, Single-P, or S-net) to determine the label identification number.

The reader assembly consists of one sender photoeye and three receiver photoeyes. Receiver photoeyes, mounted as a single unit, detect infrared light emitted from the sender unit. The reader assembly requires only line-of-sight alignment.

Sender/Receiver Reader Assemblies can operate at long distances with small labels in contaminated environments. They provide reliable label identification under all conditions of carrier motion.

2.0 Mounting

Sender-to-label and receiver-to-label distances should be held to $\pm 1/2$ inch of the dimensions on an approved reader installation drawing for your system. Mounting of the sender or receiver units at distances other than those specified by the installation drawing will reduce the ability to perform under adverse conditions and may result in an inoperable reader. Drawings #SP1052/01-423 and #SP1054/01-423 in Appendix 'A' show typical reader installations for both overhead and inverted conveyor systems.

The Sender / Receiver Reader Assemblies are designed to mount directly to Unistrut or similar type channel. See drawings #SP1054/01-421 and #SP1052/01-420 (Appendix 'A') for examples. The reader assemblies must be mounted securely. If the mounting technique allows vibration or deflection sufficient to interrupt the transmission of light from sender to receiver, intermittent operation will occur.

3.0 Wiring

Pre-wired to each of the three receiver photoeyes in a reader assembly is a six-foot long cable. These three cables are labeled: A, B, C. Pre-wired to the sender photoeye is a single 25' long unlabeled cable. All four cables must terminate at a field junction box mounted less than six cable feet from the receiver. The junction box should provide six screw terminals labeled: +, -, A, B, C, and SHIELD. When using an S-net as the control unit, a junction box is optional.

An optional junction box for the sender may be used if extra cable length is required. This junction box should provide two screw terminals labeled: +, -. Additional cabling details can be found in Appendix 'A' on drawing #SP1054/01-412 for SEA-8 applications, #SP1054/01-410 for Twin applications, or #SP1054/01-411 for Single-P applications, or SP1054/01-415 or SP1054/01-416 for S-net applications.

Note:

1. Readers are delivered with the white signal wires of the receivers prepared for termination and the black wires cut off. The black signal wires are logically inverse to the white wires and are not used.

2. References to + and - are 15 VDC for the SEA-8, or 24 VDC for all other units.
3. The drain wires of the Belden 9773 cable are normally connected to DC ground at the control unit (SEA-8, Twin, Single-P, or S-net). This is accomplished with a jumper block on the control unit circuit card. Check the control unit user manual for jumper configurations. If the distance between the control unit and the Sender/Receiver is greater than 1000 feet, or the environment is electrically noisy, then it may be necessary to connect the drain to DC ground at the reader's junction box. This is accomplished with a jumper wire installed at the junction box. Do not connect the drain at both ends of the cable. Remove the jumper block at the control unit if a jumper wire is used at the junction box. Never connect the drain to chassis ground.

4.0 Alignment

Begin the alignment procedure by loosening the sender and receiver unit's mounts to allow for manual positioning. The line-of-sight between sender and receiver must be unobstructed. Adjust the height of the sender unit by aligning the center of the photoeye lens to the approximate center of the label bits as shown in drawing #SP1052/01-423 (Appendix 'A'). Tighten the sender unit in place.

Each receiver photoeye has a red LED on the back which pulses on and off when light is received from the sender. Optimum alignment is indicated by the fastest LED pulse rate on all receiver photoeyes. (Note that the sender emits infrared light which is not visible.)

Apply power to the sensors by turning on the Smarteye control unit. Align the receiver unit up, down, left or right very slightly to locate optimum alignment (the fastest pulse rate on all receiver photoeyes.). When this is achieved, tighten the receiver unit in place.

5.0 Diagnostic Mode

The Smarteye Sender/Receiver Reader Assembly requires no adjustments. After the reader has been mounted and aligned, a diagnostic reading should be taken as a final check.

A Smarteye control unit generates the diagnostic message. If the control unit is in diagnostic mode, a diagnostic message is obtained each time a label passes the reader. The diagnostic message comes in addition to any messages (label message, error message, etc.) that would appear if the control unit were not in diagnostic mode. Check your control unit user manual for information on how to enable diagnostic mode.

Now pass a label by the reader assembly and check for a label number and diagnostic reading on the display or on the communication line. A perfect diagnostic reading is:

A	B	C	X	Y
+5	+5	+5	0	0

Diagnostic numbers are acceptable if they are within ± 5 of the perfect reading shown above. If unobtainable, read Section 6, "Troubleshooting". If acceptable diagnostic readings are still not obtained, contact Smarteye (see first page) or send email to support@smarteyecorporation.com.

6.0 Troubleshooting

6.1 Unit will not read or intermittent no-reads occur.

- **Is Sender/Receiver unit installed as shown on the Smarteye Reader installation drawing for your system?**

Sender-to-label and receiver-to-label distances should be held to $\pm 1/2$ inch of the dimensions on the installation drawing (reference section 2.0 - 'Mounting'). If this is not possible, contact Smarteye for alternative mounting dimensions (see first page for contact information).

- **Is DC power present at reader?**

The back of the sender photoeye has a red LED which illuminates when DC power is on. The back of each receiver photoeye has a red LED that blinks when light from the sender is present and DC power is on.

- **Is Sender-to-Receiver alignment OK?**

Reference section 4.0 - 'Alignment'.

- **Is Sender/Receiver unit height relative to the Label OK?**

Measure from a common reference point, such as the conveyor rail, to the center line of the slots in the Label; note dimension 'X' (see figure 1 below).

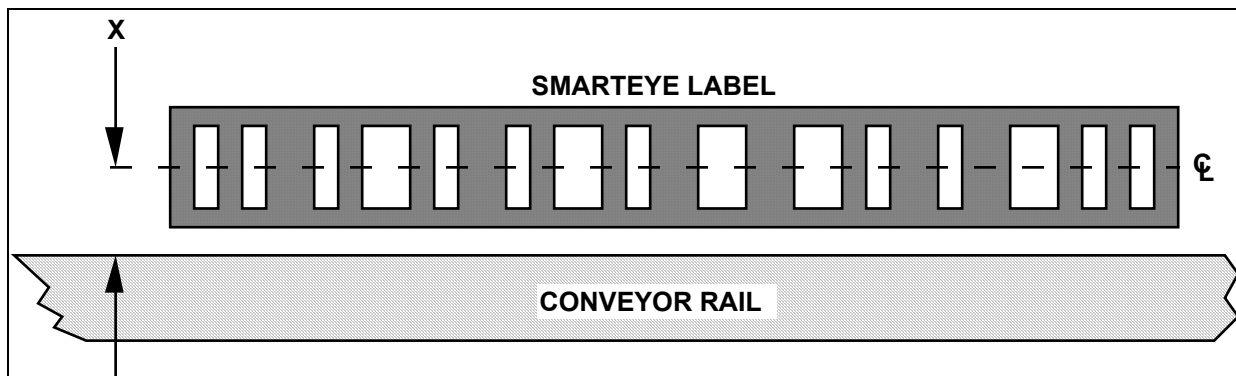


FIGURE 1

Observe the LED indicators on the back of the receiver photoeyes. Position a piece of cardboard above the reader and at the center line of the label path. Slowly move the piece of cardboard down until the LEDs turn off. Measure this position from the same reference point used to find the centerline of the slots in the Label. Move both Sender and Receiver units up or down to match the measurement 'X' taken for figure 1 (see figure 2 below).

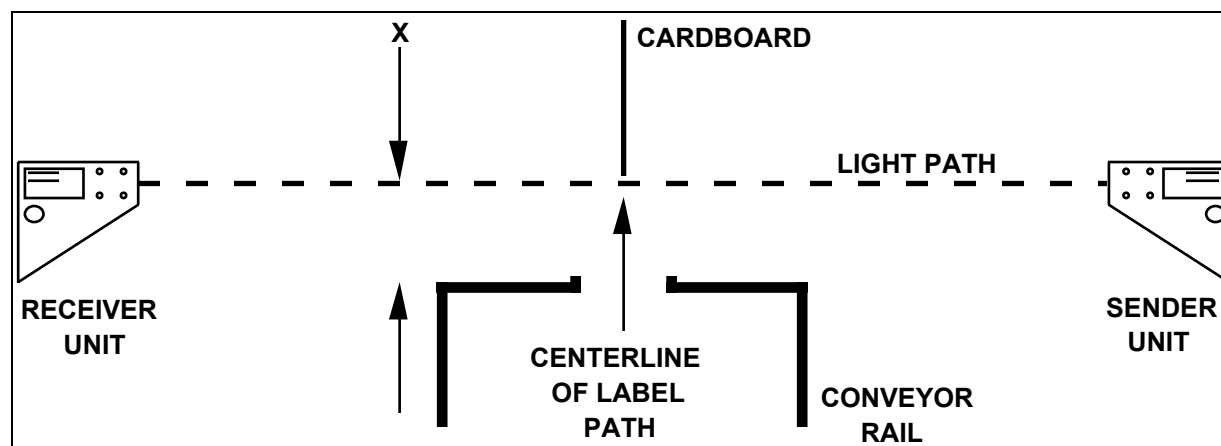


FIGURE 2

If you are using an SP1052 'stacked' type bracket, measure to the light path of the middle receiver (A).

- **Is Sender/Receiver wiring OK?**

Smarteye Corporation recommends using Belden 9773 cable and it should be connected as shown in Appendix 'A' on drawing #SP1054/01-412 for SEA-8 applications, #SP1054/01-410 for Twin applications, #SP1054/01-411 for Single-P applications, or SP1054/01-415 or SP1054/01-416 for S-net applications. Reference section 3.0 - 'Wiring'.

- **Are proper receiver photoeye transitions occurring at control unit?**

Use a DC voltmeter to measure the signal line (A,B, or C) voltage at the control unit. Connect the meter from DC ground to the signal wire position 'A' on the reader port connector. When the light path between the Sender and Receiver photoeyes is unobstructed, the signal wire voltage should be logic high. When the light path between the Sender and Receiver photoeyes is blocked, the signal wire voltage should be logic low. See the diagram below for typical logic voltage levels at the control unit.

	<u>LOGIC HIGH</u>	<u>LOGIC LOW</u>
15VDC POWER SUPPLY (SEA-8)	14.0 - 15.0 VDC	0.0 - .8 VDC
24VDC POWER SUPPLY (TWIN, SINGLE-P, S-NET)	23.1 - 24.0 VDC	0.0 - .5 VDC

Block and unblock one receiver at a time while measuring the respective signal line voltage. Each receiver signal line should transition between logic high and logic low voltages. If this is not the case, turn the control unit off and repair the wiring as necessary. If the wiring appears to be OK but proper photoeye transitions do not occur at the control unit, check the transitions at Sender/Receiver junction box using the same procedure. Replace the receiver unit if proper logic transitions at the junction box are unobtainable. Receiver failure is rare - check the wiring carefully before replacing the receiver unit.

- **Is Sender/Receiver unit diagnostic reading OK?**

Put the control unit in diagnostic mode and take a diagnostic reading. A perfect diagnostic reading is:

A	B	C	X	Y
+5	+5	+5	0	0

Do not attempt to adjust the receiver's gain; this is set at the factory and should not be changed. Diagnostic numbers are acceptable if they are within ± 5 of the perfect reading shown above. If unobtainable, check installation distances and alignment. If acceptable diagnostic readings cannot be obtained, contact Smarteye (see first page for contact information).

6.2 Unit reads Label every time but errors occur before or after the read.

Errors such as E04, E05, E06, and E15 occur before or after the read.

This situation is normal for some systems and any changes to correct this are optional. These errors are generally nuisance errors and can be caused by multiple objects other than a label which break the photoeye beams such as: trolleys, tow-bar, tripper pins, etc.

- **Optional reader height adjustment to eliminate nuisance errors.**

If possible, adjust the reader height up or down slightly to change the pattern of objects that break the photoeye beams. Make sure that all photoeye beams stay within the slots of the label. Reference section 6.1 - 'Is Sender/Receiver unit height relative to the Label OK?'.

Error E99 occurs when control unit is in diagnostic mode.

- **Does Label speed change while the first three slots of the Label pass the reader?**

Undo the carrier from the chain and push it past the reader at a constant speed.

- **Are there multiple obstructions that break the photoeye beams just before the label reaches the reader?**

Reference section 6.2 - 'Optional reader height adjustment to eliminate nuisance errors'.

Appendix A Drawings

Installation for a Typical Overhead Carrier - SP1052/01-423

Installation for a Typical Inverted Carrier - SP1054/01-423

Horizontal Installation Details - SP1054/01-421

Horizontal Installation Details - SP1052/01-420

Cable Details for SEA-8 Applications - SP1054/01-412 (CE Drawing SP1054/01-414)

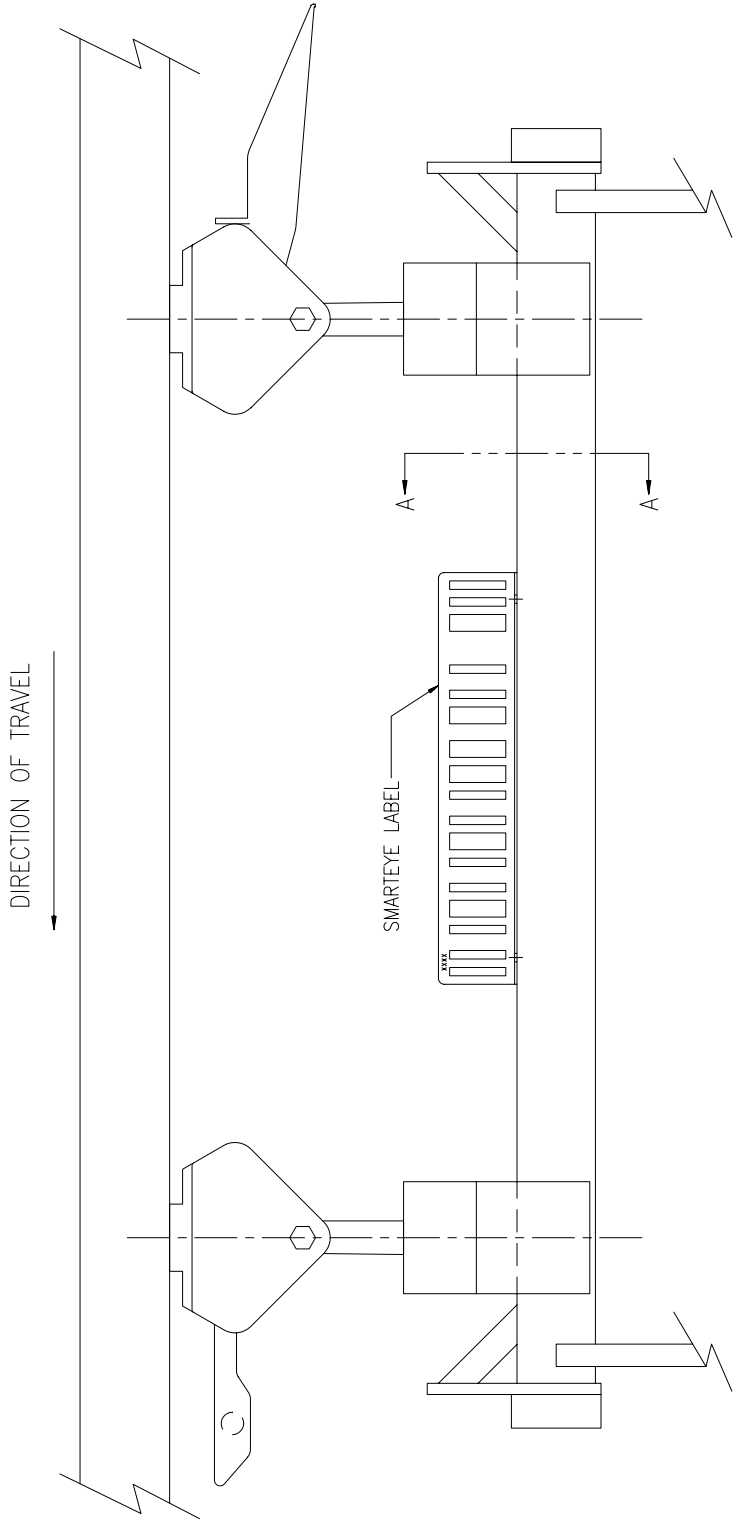
Cable Details for Smarteye Twin Applications - SP1054/01-410

Cable Details for Smarteye Single-P Applications - SP1054/01-411 (CE model not available)

Cable Details for Smarteye S-net Local Mount SP1054/01-415

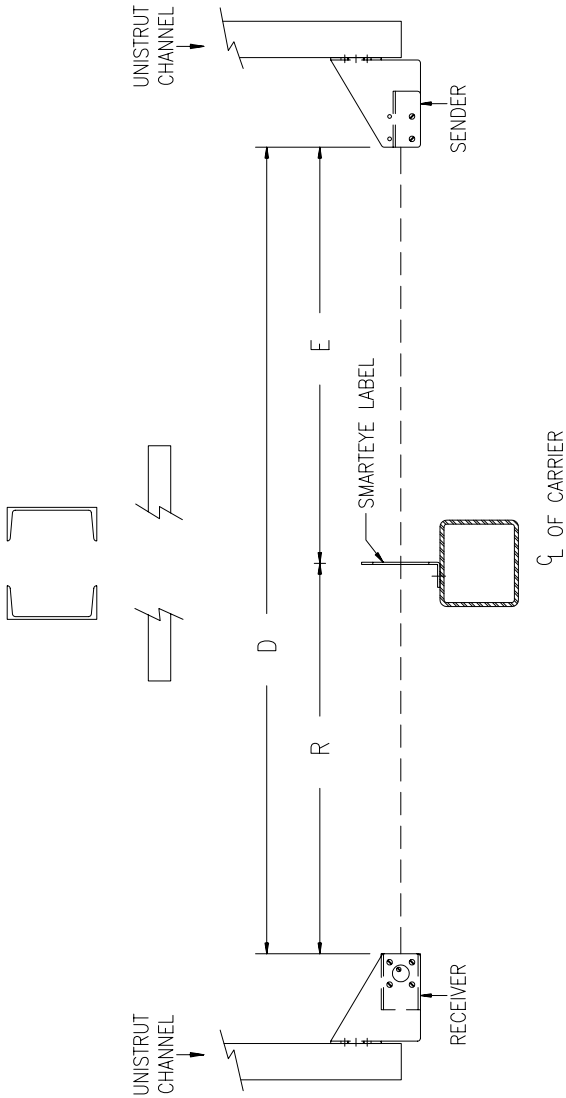
Cable Details for Smarteye S-net Remote Mount SP1054/01-416

REV	DESCRIPTION	DATE	APPR. BY
0	INITIAL RELEASE	10/19/90	MDB
	REVISED TITLE BLOCK		
1	ADDED "NOT FOR INSTALLATION"	6/7/04	MDB



EXAMPLE

- NOTE: 1. DIMENSIONS E, R, AND D SHOULD BE HELD TO +/- 1/2" OF THE DIMENSIONS SHOWN ON AN APPROVED INSTALLATION DRAWING FOR PROPER OPERATION.
2. SMARTEYE READERS ARE DESIGNED TO MOUNT DIRECTLY TO UNISTRUT CHANNEL.
3. CLEARANCES BETWEEN SENDER AND RECEIVER EQUIPMENT AND CARRIER (TRIPPER PINS, ETC.) ARE THE RESPONSIBILITY OF THE CUSTOMER AND SHOULD BE VERIFIED.
4. MOUNT SENDER AND RECEIVER SO THAT BEAMS PASS THROUGH APPROXIMATE CENTER OF SLOTS IN LABEL.



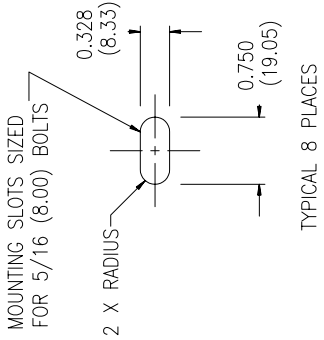
VIEW "A-A"

NOT FOR INSTALLATION
REFER TO THE APPROVED
INSTALLATION DRAWINGS
FOR THE PROJECT.

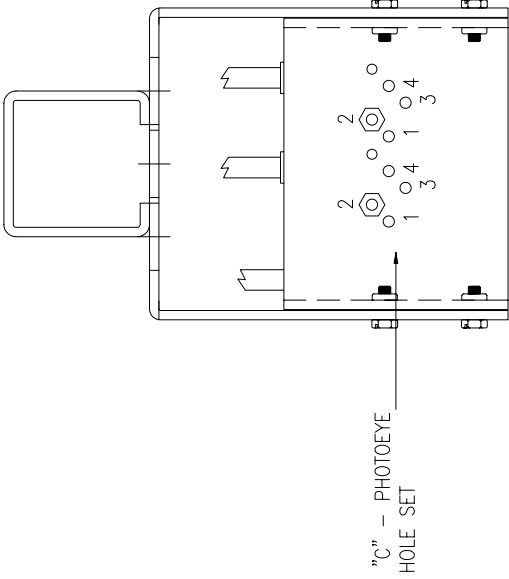
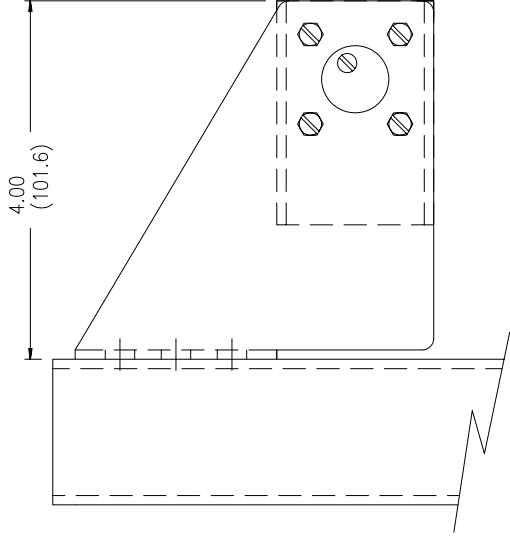


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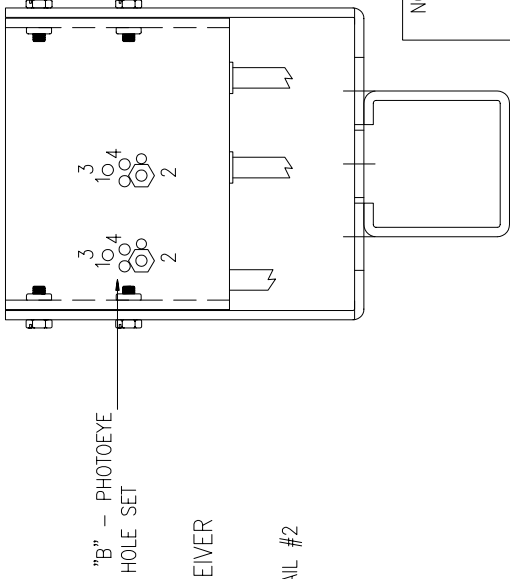
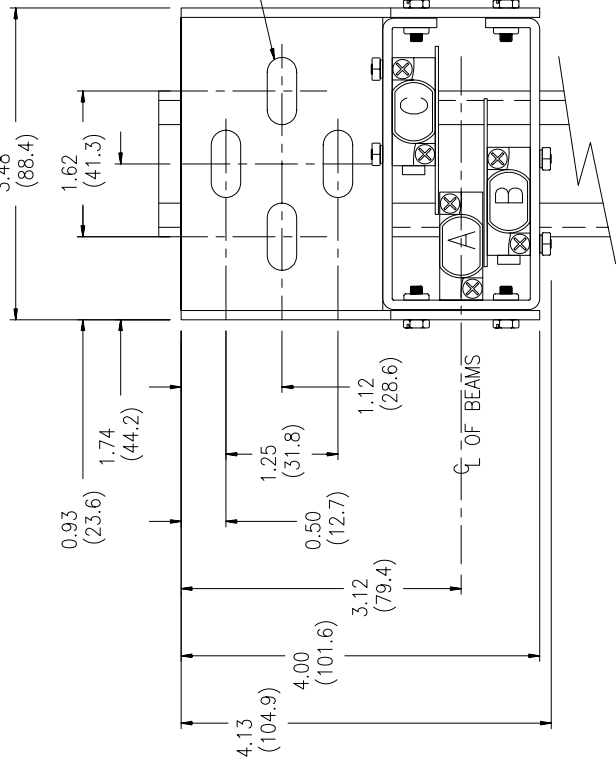
DRAWN BY:	RSA	TITLE:	
CHECKED BY:	KLC	EXAMPLE OF A SMARTEYE	
ENGINEER:	KLC	SENDER/RECEIVER INSTALLATION	
DATE:	10/18/90	FOR A OVERHEAD CARRIER	
SHEET	1 OF 1		
SCALE:	NTS	DRAWING NO.	SP1052/01-423
SIZE:	D		



DETAIL #3



LABEL MOTION



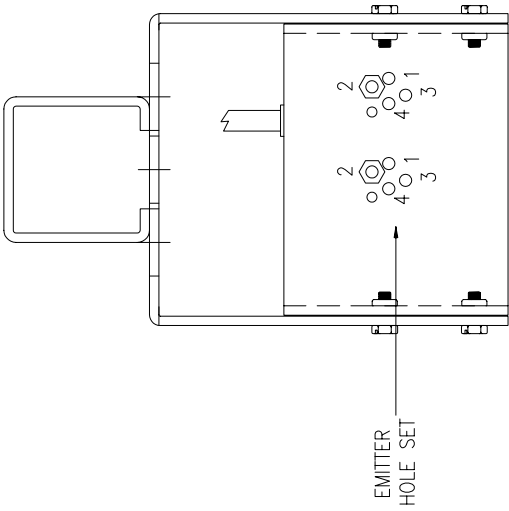
DETAIL #2

NOTES: THE SMARTEYE SENDER/RECEIVER
READER IS DESIGNED TO MOUNT
DIRECTLY TO UNISTRUT WITH
5/16 (8.00) BOLTS.

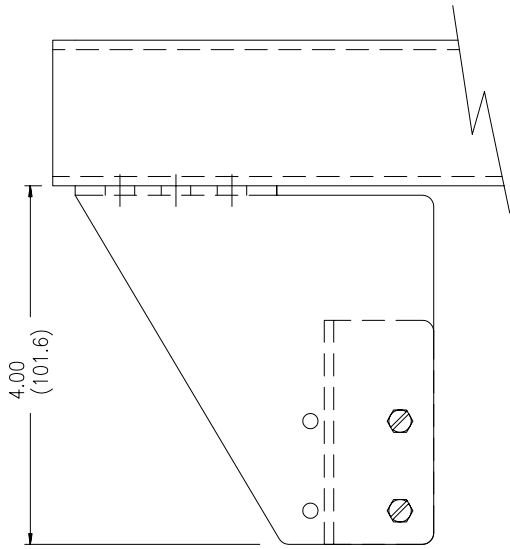
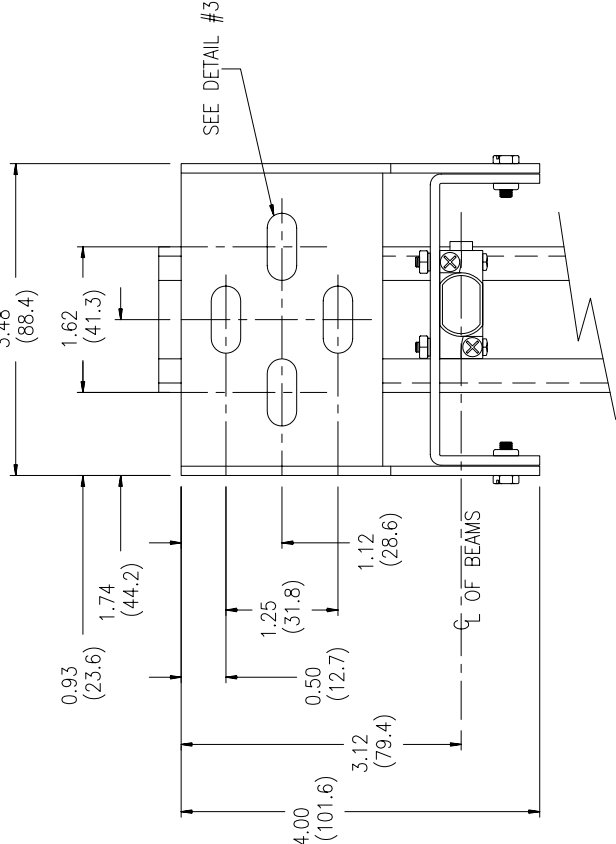
NUMBERS IN () REPRESENT
INCH EQUIVALENTS IN MM.

FOR LABELS CENTERED BETWEEN SENDER
AND RECEIVER, HOLE SETS FOR B, C
AND EMITTER ARE AS FOLLOWS:

SMALL BIT SIZE	HOLE SET
0.250 (6.35)	1
0.313 (7.95)	2
0.375 (9.53)	3
0.438 (11.13)	4



LABEL MOTION



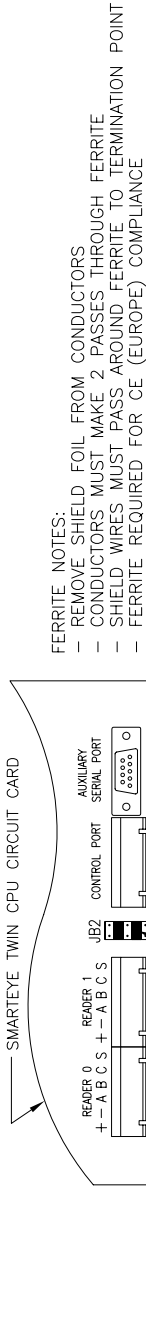
REV	DESCRIPTION	DATE	APPR. BY
0	INITIAL RELEASE	05/16/90	M.D.B.
1	ADDED MOUNTING SLOT DETAILS	06/26/90	M.D.B.
2	ADDED PHOTOEYE DESIGNATIONS	08/28/90	K.L.C.
	AND REVISED TITLE BLOCK		
3	ADDED UNISTRUT & LABEL	02/05/90	M.D.B.
	MOTION		
4	ADDED HOLE SET CHART	03/26/91	M.D.B.
5	REVISED MOUNTING SLOTS	10/31/91	M.D.B.
6	REVISED PHOTOEYE 'A'	05/10/95	M.D.B.
	INSTALLATION, ALL PEGS FACE		
	SAME DIRECTION		
	REVISED TITLE BLOCK	9/17/98	RSA
7	REMOVED 0.500 OPTION	9/30/03	RSA

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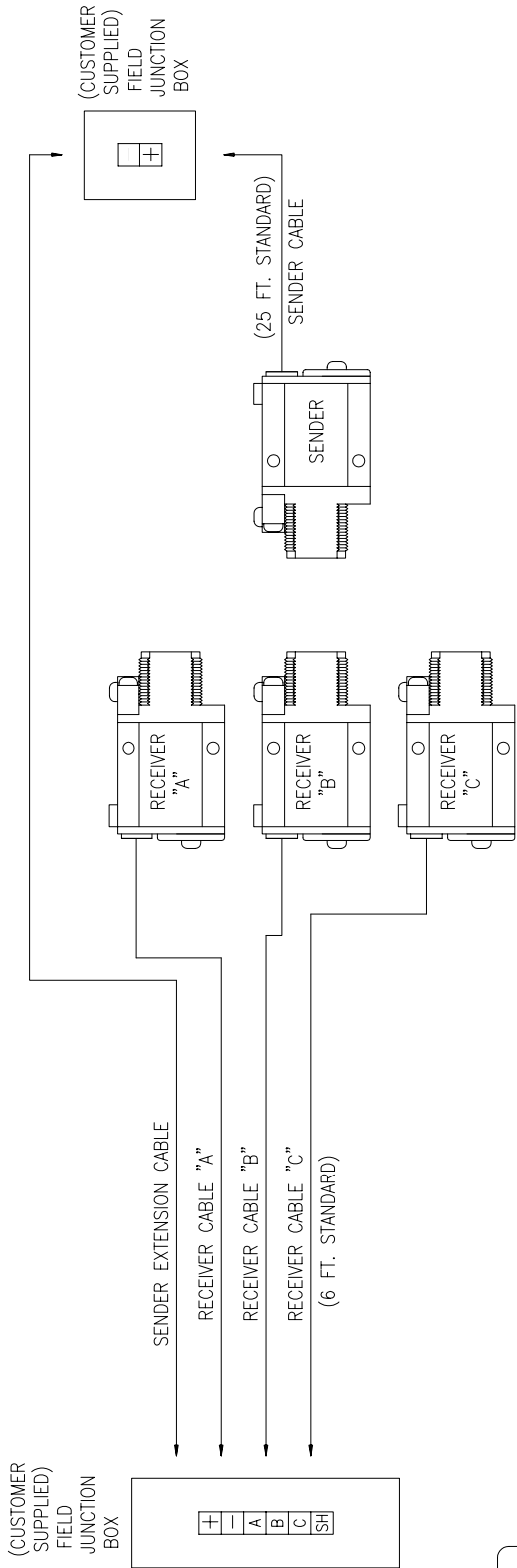
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DRAWN BY:	R.S.A.	TITLE:
CHECKED BY:	M.D.B.	SMART-EYE
ENGINEER:	M.D.B.	SENDER / RECEIVER
DATE:	5/15/90	HORIZONTAL INSTALLATION
SHEET	1 OF 1	DETAILS
SCALE:	NTS	DRAWING NO.
SIZE:	D	SP1052/01-420

REV	DESCRIPTION	DATE	APPR. BY
0	INITIAL RELEASE	2/4/93	MDB
1	ADDED DRAIN TERMINATION NOTES	5/4/93	MDB
2	CLARIFIED SHIELDING FOR LRx	7/26/93	MDB
3	ADDED FERRITE DETAILS	3/27/98	MDB
4	REVISED SENDER CABLE LENGTH TO 25'	5/7/4	MDB



FERRITE NOTES:
- REMOVE SHIELD FOIL FROM CONDUCTORS
- CONDUCTORS MUST MAKE 2 PASSES THROUGH FERRITE
- SHIELD WIRES MUST PASS AROUND FERRITE TO TERMINATION POINT
- FERRITE REQUIRED FOR CE (EUROPE) COMPLIANCE



JUNCTION BOX DETAILS

Belden 9773 (TO ELECTRONICS ASSEMBLY)		JUNCTION BOX	
TO PHOTOEYES			
ALL PHOTOEYES (BROWN)	→	+	→ (RED)
ALL PHOTOEYES (BLUE)	→	-	→ (WHITE)
RECEIVER A (WHITE)	→	A	→ (BLACK1)
RECEIVER B (WHITE)	→	B	→ (BLACK2)
RECEIVER C (WHITE)	→	C	→ (BLACK3)
NC	→	SHIELD	→ DRAIN

NOTES:

1) Belden 9773 and 9873 cable paired as follows:

Black 1 is paired with Red
Black 2 is paired with White
Black 3 is paired with Green

2) Green is not used (see cable detail LRx)

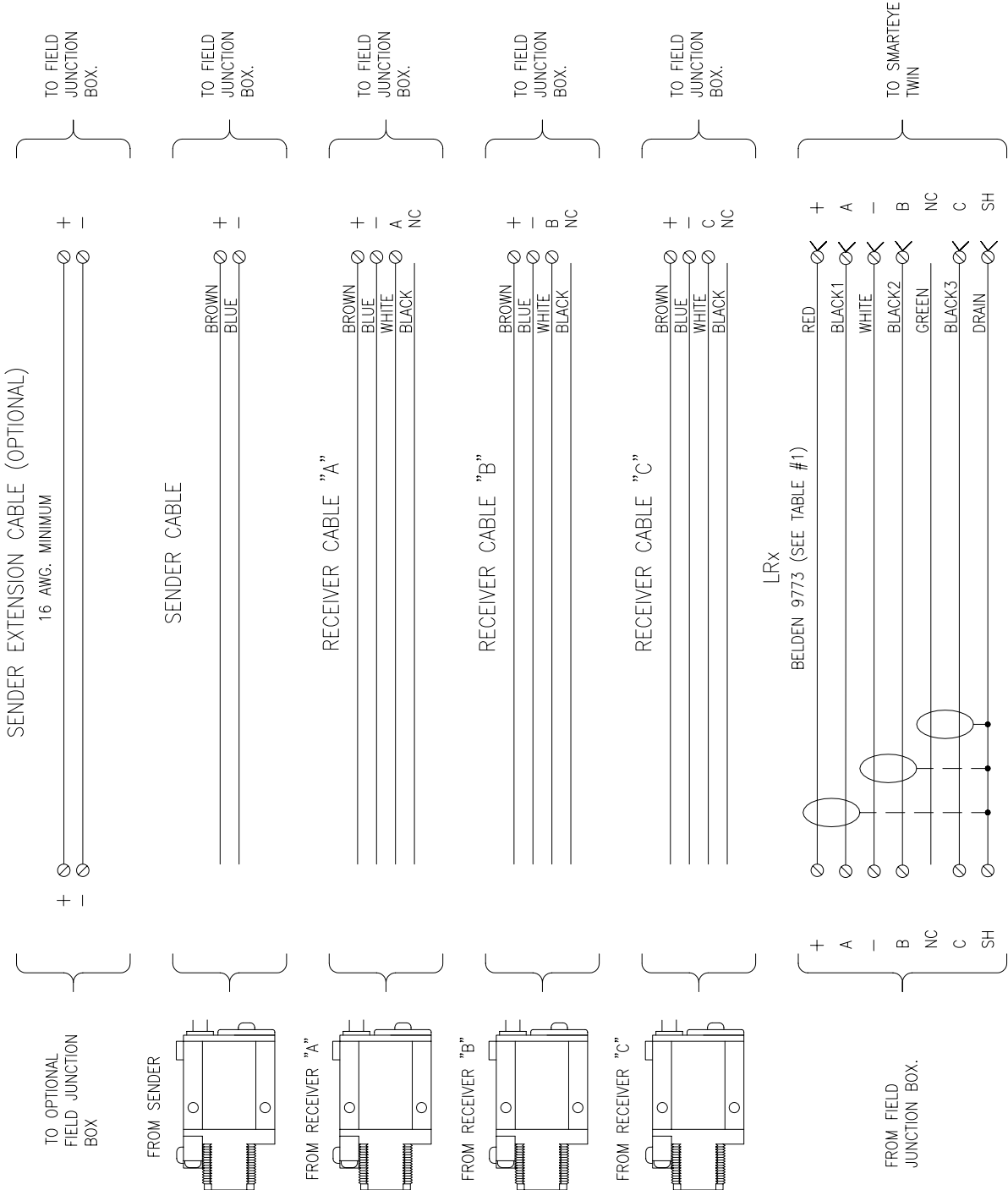
3) The drain of cable LRx is normally connected to DC GND at the twin CPU circuit card via jumper JB3-1

4) The drain wire of LRx must be connected at one end only.

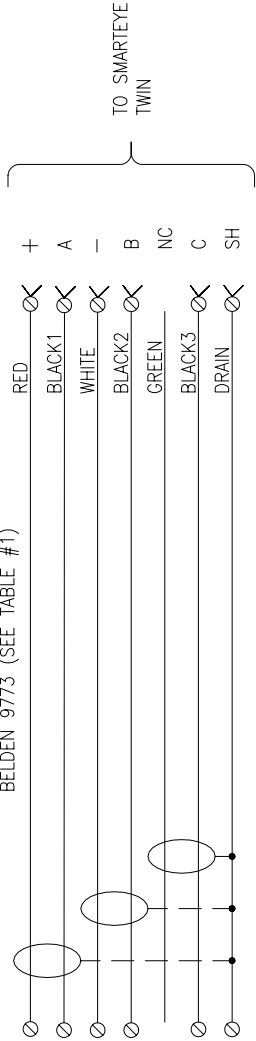
TABLE #1
Cable Type and LRx Max. Distance

AWG	Belden#	Distance Feet
18	9773	1500 * Preferred Installation
20	9873	725

Cable Details




LRx
Belden 9773 (see Table #1)



LEGEND

- Ø - SCREW TERMINATION
- Ø - PLUG-IN SCREW TERMINATION
- NC - NO CONNECTION

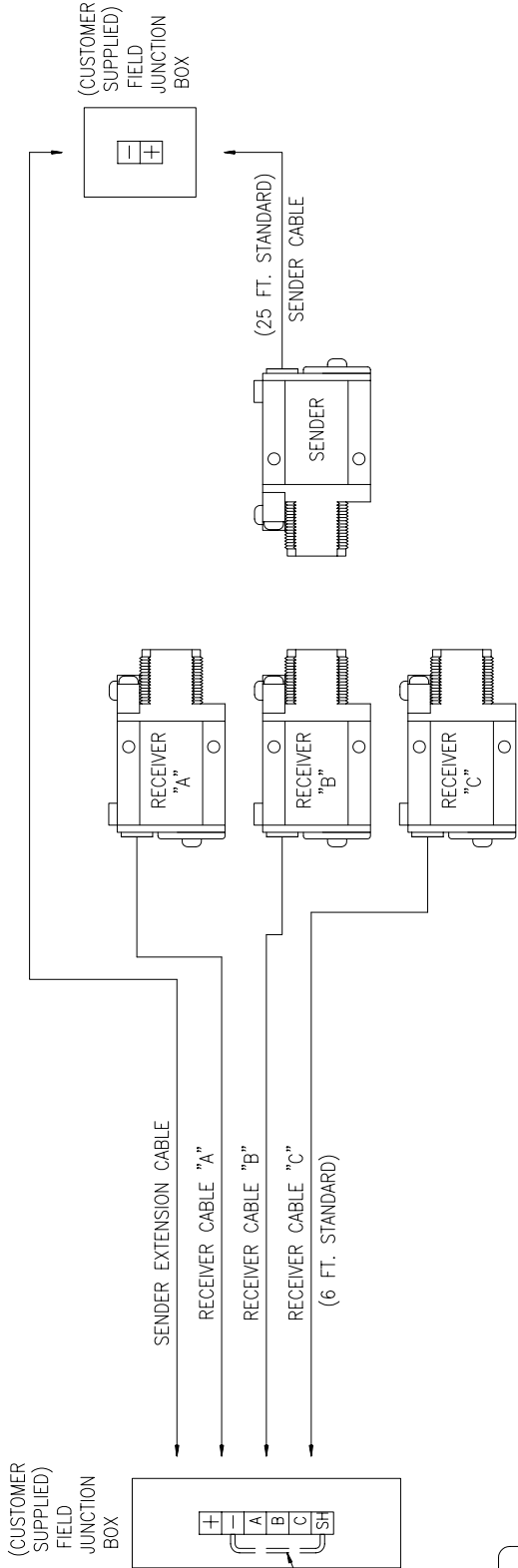
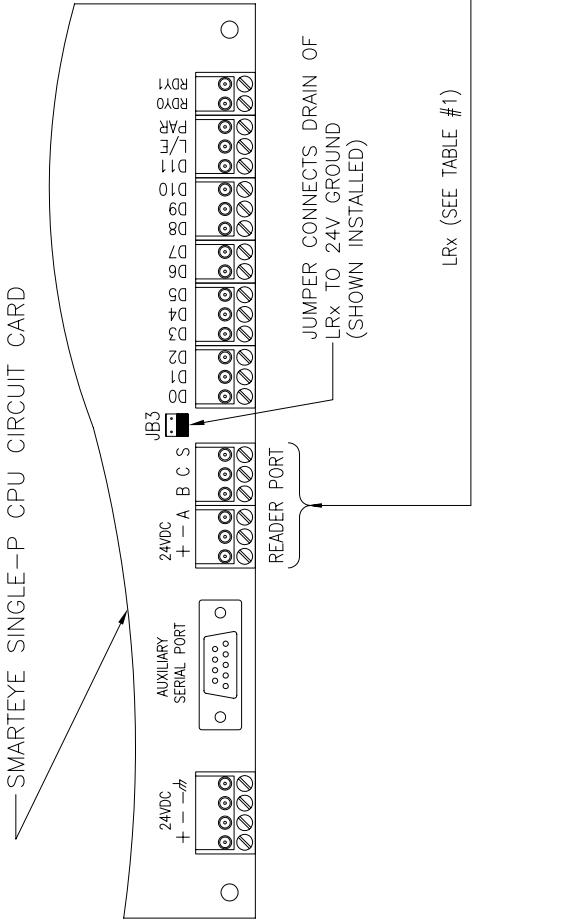


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DRAWN BY:	RSA	TITLE:
CHECKED BY:	KLC	SMARTEYE SENDER / RECEIVER
ENGINEER:	KLC	CABLE DETAILS FOR TWIN
DATE:	2/4/93	APPLICATIONS
SHEET	1 OF 1	
SCALE:	NTS	DRAWING NO. SP1054/01-410
SIZE:	D	

REV	DESCRIPTION	DATE	APPR. BY
0	INITIAL RELEASE		
1	ADDED DRAIN TERMINATION NOTES	5/4/93	MDB
2	CLARIFIED SHIELDING FOR LRx	7/26/93	MDB
REVISED TITLE BLOCK			
3	REVISED SENDER CABLE LENGTH	2/10/04	RSA
4	REVISED SENDER CABLE LENGTH	06/08/04	RSA



JUNCTION BOX DETAILS

Belden 9773 (TO ELECTRONICS ASSEMBLY)		JUNCTION BOX	
TO PHOTOEYES			
ALL PHOTOEYES (BROWN)	→	+	→ (RED)
ALL PHOTOEYES (BLUE)	→	-	→ (WHITE)
RECEIVER A (WHITE)	→	A	→ (BLACK1)
RECEIVER B (WHITE)	→	B	→ (BLACK2)
RECEIVER C (WHITE)	→	C	→ (BLACK3)
NC	→	SHIELD	→ DRAIN

NOTES:

1) Belden 9773 and 9873 cable paired as follows:

Black 1 is paired with Red
Black 2 is paired with White
Black 3 is paired with Green

2) Green is not used
(see cable detail LRx)

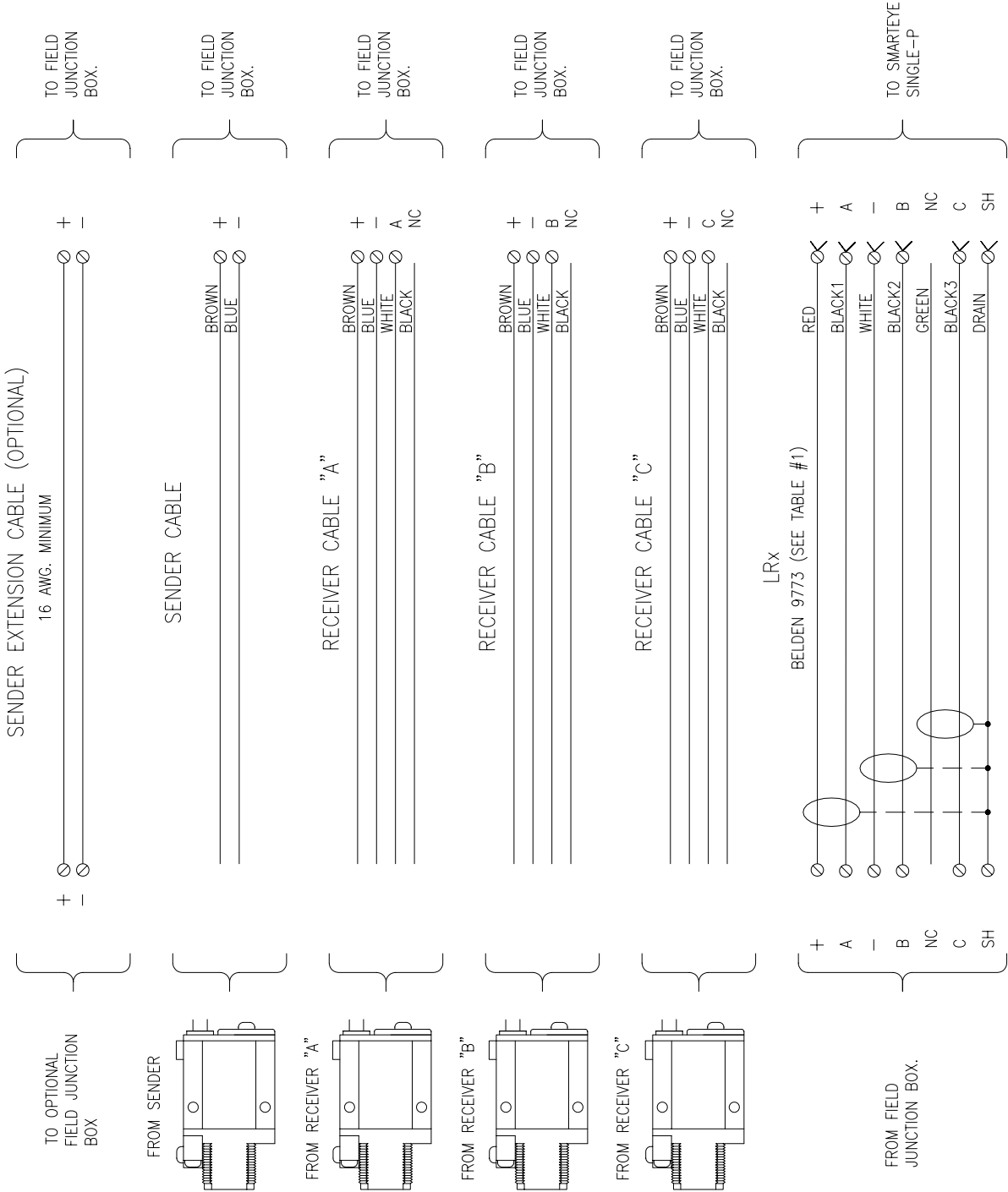
3) The drain of cable LRx is normally connected to DC GND at the single-P CPU circuit card via jumper JB3-1

4) The drain wire of LRx must be connected at one end only.

TABLE #1
Cable Type and LRx Max. Distance

AWG	Belden#	Distance Feet
18	9773	1500 * Preferred Installation
20	9873	725

Cable Details



LEGEND

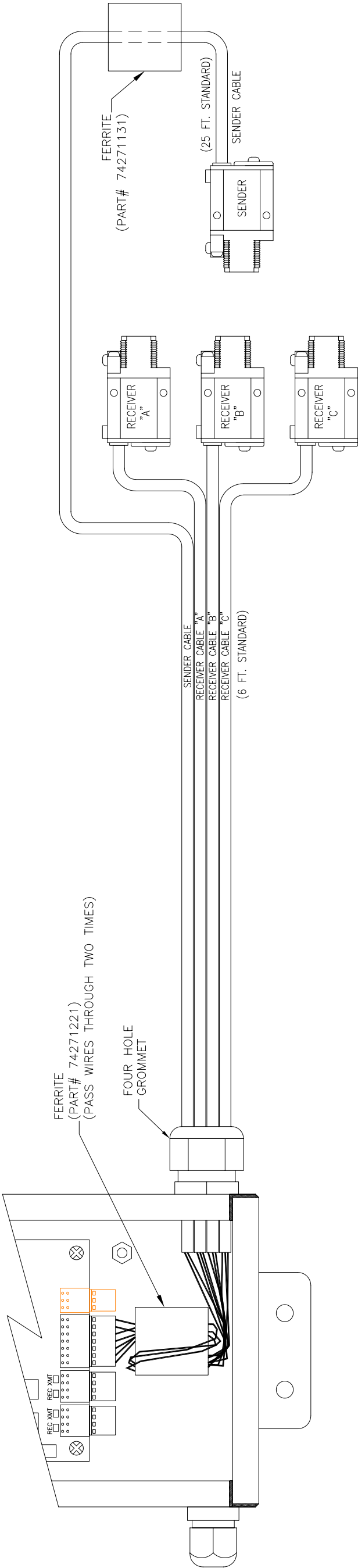
- - SCREW TERMINATION
- ⊗ - PLUG-IN SCREW TERMINATION
- NC - NO CONNECTION



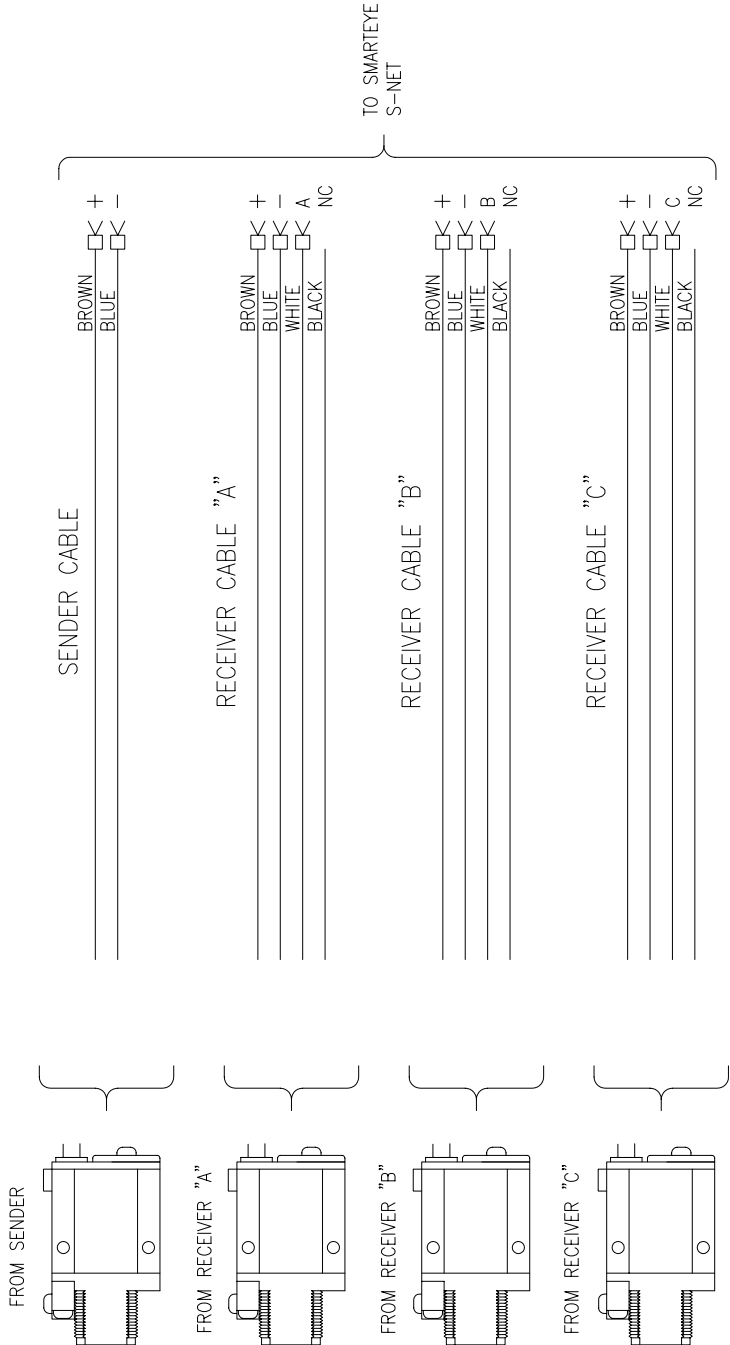
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DRAWN BY:	RSA	TITLE:	
CHECKED BY:	KLC	SMARTEYE SENDER / RECEIVER	
ENGINEER:	KLC	CABLE DETAILS FOR SMARTEYE	
DATE:	1/21/93	SINGLE-P APPLICATIONS	
SHEET	1 OF 1		
SCALE:	NTS	DRAWING NO.	SP1054/01-411
SIZE:	D		

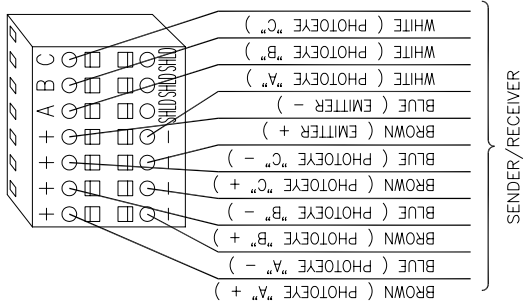
REV	DESCRIPTION	DATE	APPR. BY
0	INITIAL RELEASE	10/23/07	RSA



CABLE DETAILS




S-NET CONNECTION DETAILS



LEGEND

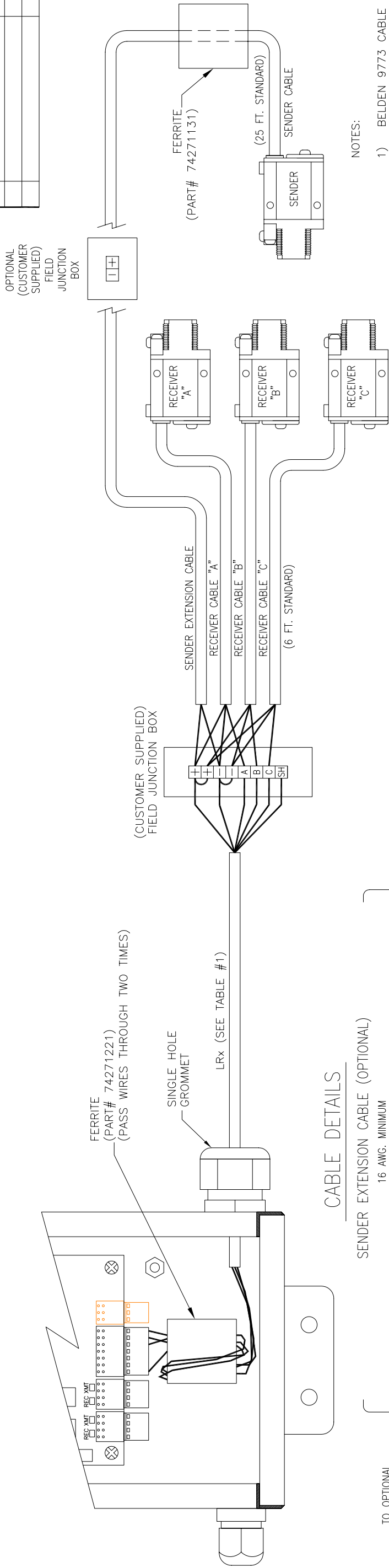
- < - PLUG-IN CAGE CLAMP TERMINATION
- NC - NO CONNECTION



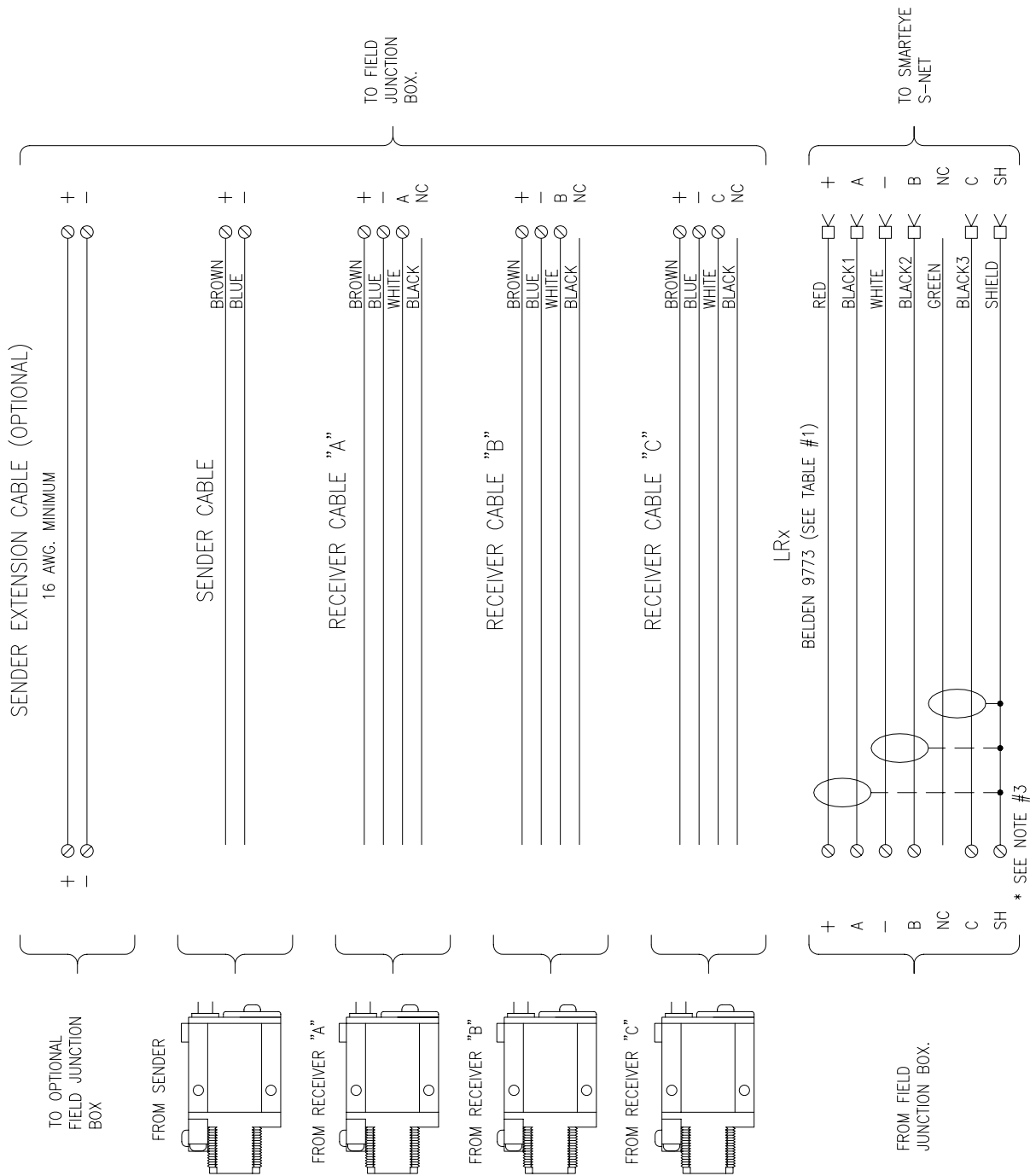
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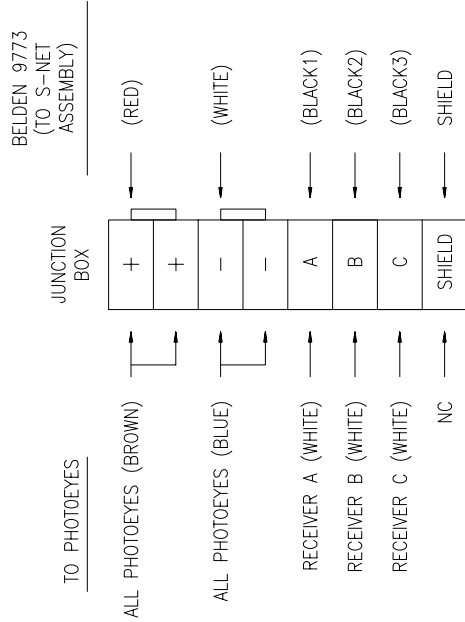
DRAWN BY:	RSA	TITLE:	
CHECKED BY:	RSA	SMARTEYE SENDER / RECEIVER	
ENGINEER:	MDI	CABLE DETAILS FOR S-NET	
DATE:	10/23/07	LOCAL INSTALLATION	
SHEET	1 OF 1		
SCALE:	NTS	DRAWING NO.	SP1054/01-415
SIZE:	D		

[illegible]

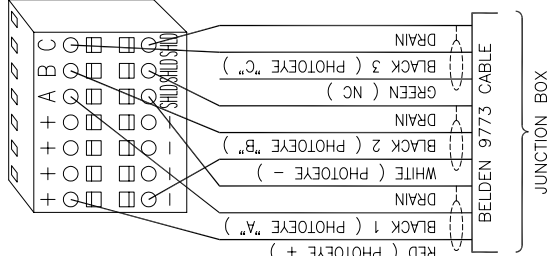
CABLE DETAILS



JUNCTION BOX DETAILS



S-NET CONNECTION DETAILS



NOTES:

- 1) BELDEN 9773 CABLE PAIRED AS FOLLOWS:

BLACK 1 IS PAIRED WITH RED
BLACK 2 IS PAIRED WITH WHITE
BLACK 3 IS PAIRED WITH GREEN
- 2) GREEN IS NOT USED
(SEE CABLE DETAIL LRx)
- 3) THE SHIELD OF CABLE LRx MUST BE CONNECTED AT ONE END ONLY. THE SH TERMINAL IN THE REMOTE JUNCTION BOX IS FOR LANDING THE SHIELD WIRE ONLY. IT IS NOT CONNECTED TO GROUND.

LEGEND

- Ø - SCREW TERMINATION
 □ - PLUG-IN CAGE CLAMP TERMINATION
 NC - NO CONNECTION

TABLE #1
CABLE TYPE AND
LRx MAX. DISTANCE

AWG	BELDEN #	DISTANCE FEET
18	9773	500

THE SHIELD OF CABLE LRx
NORMALLY CONNECTED TO 24V
GROUND AT THE S-NET CIRCUIT
BOARD VIA JUMPER J1-8. IN A
NOISY ELECTRICAL ENVIRONMENT,
IT MAY BE NECESSARY TO
GROUND THE SHIELD AT THE
REMOTE JUNCTION BOX. REFER
TO THE 'REMOTE READER
MOUNTING' SECTION OF THE USER
MANUAL FOR DETAILS.

**SMARTEYE**
CORPORATION

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PHONE (248) 853-4495 FAX (248) 853-8539

DRAWN BY:	RSA	TITLE:
CHECKED BY:	RSA	SMARTYEY SENDER / RECEIVER
ENGINEER:	MDI	CABLE DETAILS FOR S-NET
DATE:	10/23/07	REMOTE INSTALLATION
SHEET	1 OF 1	
SCALE:	NTS	DRAWING NO.
SIZE:	D	SP1054/01-416



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